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ABSTRACT

Prepared as part of the College of the Mainland's reaffirmation of accreditation, this report describes international interest in the information society concept, and defines an information society as the evolutionary outcome of the progressive development and decentralization of computing technology and communications technology. The technological ability to substitute electrical information as symbolic information for physical information and transmit the substituted symbols via electronic media is explained as the technological basis of such a society. A forecast of the status of the information society in the United States in the 1990's is presented, and computer-based systems that will affect educational curricula in the fields of mathematics and chemistry are identified. An explanation of the concept of information utilities is followed by discussions of the human resources dimension of effectively managed information utilities, and value trends and their societal implications in the information society. The references and bibliography include 13 items. (LMM)

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COMPUTERS AND TELECOMMUNICATIONS

A SURVEY OF THE STATUS, CHARACTERISTICS AND IMPLICATIONS

OF

THE INFORMATION SOCIETY

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AN ELEMENT OF THE ACCREDITATION SELF-STUDY

AT

COLLEGE OF THE MAINLAND

TEXAS CITY, TEXAS

by

JERRY L. VAUGHAN, CHAIRMAN

PROJECTIONS COMMITTEE

AUGUST 1, 1982

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Introduction

An Information Society is the evolutionary outcome of the progressive development and decentralization of computing technology and communications technology. Both of these electronic technologies had their practical origins in the late 19th century. Each received its developmental thrust as the result of two world wars and the international tensions of the Cold War. The space program provided the basic system engineering concepts upon which the Information Society is developed. Concept marketability, and the economic and resource constraints of growing societal complexity on the late 20th century have provided the impetus for further development and applicaion of the technologies that serve the Information Society.

The technological ability to substitute electrical information (as symbolic information) for audible, printed, visual, or physical information--and transmit the substituted symbols via electronic mediums--is the technological basis of an Information Society. It may be said that the merger of logical computer technology with communications technology has resulted in information technology that characterizes the Information Society. There are significant short and long term implications for this historical development.

THE INFORMATION SOCIETY

International Status

The Information Society is emerging on a world-wide basis. According to Dr. Yoneji Masuda (1981), former Executive Director of the Japan Computer Usage Development Institute and Chief Researcher of the Japan Productivity Center, two Information Society experiments were initiated in 1971 by the Japanese Ministry of Posts and Telegraphs and the Ministry of International Trade and Industry. These Community Communications research and development endeavors, known as TAMA CCIS and HI-OVIS, cost the Japanese government $20 million. The TAMA CCIS experiment involved 90,000 households and a population of 230,000 people. The information services provided were--

1. TV Re-transmissions which enabled previously unavailable programming and improved picture quality.
2. Original Telecasting which enabled (1) local news, (2) cultural and educational affairs, (3) living information, (4) medical information and (5) entertainment.
3. Automatic Repetition Telecasting which enabled participants to prepare and telecast 10-15 minute personal message programs.
4. Pay Television which enabled the acquisition of desired programming by insertion of a special key or special ticket.
5. Flash Information Service which enabled new and up-dated information to be telecast several times a day.
6. Facsimile Newspaper Service which enabled full sized pages of newspapers to be projected for home facsimile systems.
7. Memo-Copy Service which enabled the transmission of special notices to households. These notices included procedural and guidance information to government offices, names of clinics

open on holidays, shopping and bargain sales guides, and lecture, meeting and other activity schedules.

8. Auxiliary Television which provided emergency information and information on special social needs such as blood donor requirements.

9. Broadcast and Response Service which enabled interactive (two-way) communications and the accumulation of public opinion information on such matters as education, consultation and testing.

10. Still Picture Requests which enabled the subscriber to have any of 6,300 still pictures to be retrieved and displayed.

11. Theft and Disaster Prevention which enabled the participants to be aware of emerging crime, traffic, disaster and accident patterns.

The TAMA CCIS experiment was evaluated highly by the participating communities, the local government and the central government on the basis that (1) it provided an important infrastructure for future communities and (2) it was an effective means of enabling residents to participate fully in community activities.

The Japanese HI-OVIS experiment is charactized by the following features--

1. It was the world's only optical fiber communications network in practical use. The signifiance of optical fiber technology is that information density is several times greater than the capacity of copper wire, there is little electrical interference and noise, the potential for the invasion of privacy is minimized and the production of fiber optic cable requires less energy than the production of similiar lengths of copper cable.

2. It permits 2-way multiplex communication by visual, audio and digital methods. The system does not use telephone lines and it accomodates both the voice and image of the users.
3. The HI-OVIS city is a wired city. No antenna rises from the roofs; there is one community antenna.

These experiments were the forerunners of the videotex concept.

The Japanese are expanding the TAMA CCIS and HI-OVIS concepts to other cities and they plan to coordinate industrial information via the networks by the mid-1980's. The Japanese "Long Term Basic Plan", developed by the Japan Computer Usage Development Institute, calls for an investment of $65 billion by 1985 for the development and implementations of Administration Data Banks, Regional Remote Control Medical Systems, Computer-Oriented Education, Pollution Prevention Systems, Think Tank Centers, Small Enterprise Information Centers, and Labor Re-Development Centers.

Canada has initiated the TELEDON videotex system to facilitate public service and community needs. It is estimated that by 1986, 620,000 Canadians will be subscribing to travel schedules, news, weather and sports headlines, stock market quotations, consumer bulletins, entertainment guides, classified ads, and yellow page listings. Future applications will include medical advice, national career and employment information, electronic directories, dictionaries, encyclopedias and other reference networks. It is expected that the TELEDON system will enable (1) wider access to information, (2) the transmission of new ideas and concepts with greater ease, (3) an opening of bureaucracies for public scrutiny and criticism, (4) the elimination or minimization of

many centralized decisions, and (5) afford more flexible rules and regulations in institutions, business and government.

Project TERESE in Sweden is aimed at providing information rapidly and inexpensively while assessing how the technology can be used to promote regional development.

According to Prime Minister Lee Ruan Yew (Houston Post, June 2, 1982), Singapore has undertaken a long-range plan to develop itself as "an information and brain service center" by the 1990's. The Singaporean plan involves the allowance of 5 to 10 year tax holidays for select companies. The Singapore government estimates the employment of 8,000 information technology professionals by the year 1990.

Domestic Status

In the United States, videotex systems are commercially operating in approximately 50,000 homes and enterprises. According to Tom McKnight, a principal in Orion Telecommunications, Ltd. (World Future Society Conference, 1982), there are approximately 70 experiments with videotex now being conducted by small newspaper chains. Mr. McKnight indicated that the results of these experiments are generating new businesses with entirely new characteristics. These are new businesses that constitute an information provision industry. Both Mr. McKnight and Mr. Hal Logan, Manager of Electronic Research for the Washington Post agreed that these new businesses will not replace the traditional information providers--such as newspapers (which have educational implications). However, they agreed that newspaper, and publication house circulations will be adversely affected by the computer and telecommunications combination. In their opinion the deterrent to growth, if any deterrent can be said to exist, lies in the present rate

and subscription cost structures that prohibit many users from gaining the full benefit of the new technologies. Regardless of the present pricing structures, executives at the New York Videotex Conference held in June of 1982, agreed that the videotex concept will be a $9 billion market serving 15 million to 20 million U.S. homes by 1990. It is estimated that each of these homes will budget between $450 and $600 per month for telecommunication services. A report commissioned by the National Science Foundation (Houston Chronicle, July 11, 1982) indicated that the videotex concept will be in 40 percent (or more) of the U.S. homes and serve approximately 70 million people by the year 2000. The same NSF report estimates that by the year 2000 most employment will be in the home rather than in commutation to an office.

In the United States, the anti-trust decisions regarding AT&T and IBM, together with U.S. control of satellite technology has precipitated a highly competetive, capital intensive battle for programming and distribution position in the lucrative telecommunications markets. Jane Hall, editor of "View", a telecommunications industry publication, has commented that "it's like a gold rush. They don't mind losing money in the short run in order to pre-empt operator and viewer loyalty for the long run" (Houston Chronicle, July 1982).

Forecasters for the AT&T Bell System indicate an explosive growth in the telecommunications interconnect infrastructure beginning in 1984.

Virtually every occupation and profession will be affected by computers and telecommunications. Even the venerable draftsman is vulnerable as the next generation of SMART and EXPERT computers will enable the engineer to make direct graphic design entries and drawing

corrections. By 1990 the use of artificial intelligence will alter engineering design and manufacturing processes.

According to Mr. Earl C. Joseph , Staff Scientist/Futurist for Sperry Univac Defense Systems (1982) - "two Expert Systems have recently reached the "champion" level - they are DENDRAL and MACSYMA. DENDRAL is a knowledge-based Expert A1 System for solving a class of symbolic chemistry problems. It is the culmination of 16 years of A1 research and experimentation at Stanford University. It has reached the level wherein there exists no other better means (human or machine) for doing symbolic chemistry, MACSYMA solves symbolic algebraic equations and performs differential and integral calculus. It also has reached the championship level in that no other better means (human or machine) exists for performing general mathematics."

"In development, are numerous A1 knowledge-based Expert Systems that soon could reach "champion" level status. Included in this growing list are A1 knowledge-based Expert Systems for such applications as; (1) Air Traffic Control, (2) Computer Configuration Management, (3) Crises Management, (4) Computer-Aided Design, and (5) Computer Maintenance."

"We are now at a new technological threshold. We are entering a new era, for amplifying human powers for perceptual, reasoning, decision making, inventing, creating, thinking and other mental activities. This new era results from our research on intelligent and expert machines for amplifying our mind's activities. Such amplification of knowledge is achieved by initating artificially the brain's reasoning and other mental powers with computer technology in the form of expert systems. The public is ill prepared for the potential and opportunities that this affords."

The systems that will result from the exchange of expert information via telecommunications networks will have a profound effect upon the world.

Musuda (1981) forecasts the refinement of primary industries, secondary industries, and tertiary industries. He forecasts the development of quaternary industries consisting of information, knowledge, arts and ethics.

Human Values in an Information Society

The guiding values of the Industrial Society that spawned the emerging Information Society are based upon material consumption. The guiding values of the Information Society are based upon information values. Information values are reflected by (1) low consumption of resources, (2) time-value, in which the future implications of present knowledge and present activities are the basis for decision-making and (3) place-value, which reflects low physical mobility for all but leisure purposes. The objective of information values is the substitution of the stress and consumption characteristics associated with the requirements of Industrial Society by the characteristics of the Information Society concept of INFORMATION-SPACE. Information-space is characterized by human and technological networking concepts. Information-space, in an Information Society, results when information values are adhered to. Information values result in greater mental challenges, higher productivity and less resource consumption. The Information Society represents a transition (a meta change) from the society of the Industrial Era to the Society of the Communications Era. The communications era may ultimately represent a system break from the Industrial Era.

INFORMATION UTILITIES

Characteristics of an Information Utility

Perhaps the greatest opportunities to be realized by entrepreneurs in the Information Society comes from an understanding of the concepts of Information Utilities, an Information Utility is characterized by its content and its structure. The content is a function of the nature of information contained and processed in an Information Utility. The structure is a function of the technology and management processes employed by the Information Utility.

An Information Utility is a facility, or facility-concept. It acquires, processes, stores, disseminates and (or) coordinates information. An Information Utility may be centralized or decentralized with respect to location or system functions. It may be coordinated and controlled, or it may function autonomously. It may have permanent or temporary status with respect to a given location and it is user oriented rather than owner, manager or content oriented. An Information Utility may serve individuals or networks.

Technologically, an Information Utility has access to data bases or it may be a "gateway" to data bases. It enables the sensing, acquisition, synthesizing and distribution of information. An Information Utility may facilitate any or all of the following:

(1) Computer Conferencing

(2) Teleconferencing

(3) Electronic Mail

(4) TWX/TELEX

(5) Office Automation

(6) Data Processing

(7) Facsimile Communications

(8) Data Base Interrogation

The Nature of Information

In the information society the concept of "information" has special characteristics. Data is a fact (sometimes quantified) that describes one attribute of a process or event. Information is the sum total of all accessible data or fact. Intelligence and information are synonymous. Knowledge is the organization of information in a way that is useful. Wisdom is the integration of knowledge and the recognition of interrationships. Futurism is the interpretation of information-based activities in terms of future implications. Knowledge and Wisdom are integral to Futurism. Thus a person or organization with a futuristic orientation acts--not "because" of information, but with information "in order to".

In general, information has the following characteristics--

1. Information is renewable and adaptable.
2. Information is expandable.
3. Information can be stored.
4. Information tends toward entropy. Thus it needs updating and verification
5. Information is substitutable for capital, resources, and humans.
6. Information is transportable.
7. Information is diffusive.
8. Information is potent, agressive, and imperialistic. It can dominate or overload any system.

9. The more refined or pertinent the information, the greater its tendency to "break-out" of its system and cross displinary lines.
10. Information is transactive, non-consumable, and sharable.
11. Information is value laden.
12. Information increases uncertainty for those who do not possess it.
13. Information is interdisciplinary. It is useful in contectual relationships.
14. Information is used in the formation of knowledge, concepts, and systems.
15. Information accumulates.
16. Information can be ignored or discounted.
17. Information can be diguised or coded.

Types of Information Utilities

It is anticipated (Masuda, 1981) that three types of Information Utilities will dominate the Information Society. They are generally described as follows--

1. The Commercial Information Utility

   This type of Information Utility will exist for its profit potential. It will be capitalized by convential methods. Its purpose will probably be to facilitate personal or commercial conveniences and alternatives. It will be characterized by efficiency and quality of services.

2. The Institutional Information Utility

This type of Information Utility will exist primarily to facilitate social equity and welfare in the areas of medical care, education and social or governmental services. Funding is likely to be a function of tax structures and participation fees or rates. They will function essentially in the public interest and will be relatively inexpensive to insure access.

3. The Private Information Utility

This type of Information Utility may take the form of special interest networks (voluntary communities) or individual "intelligence" consultants. The basic purpose of this type of Information Utility will be information accumulation, processing, and interpretation. This type may or may not exist for profit but will exist for the purposes of Issue Management, Problem-solving and Strategic Planning. These utilities will be autonomous and creative. They will be financed either through contributions or fees. The organization and function of these utilities is described and elaborated upon by Lipnack and Stamps (1982) and by Spencer (1982).

Information Utility Management

With an unmistakeable trend towards an Information Society it is worthwhile to note the demographic make-up of the future organization. Dr. Arthur Shostak of Drexel University (1982) identifies the future technical and communications employee as possessing the following attitudes and characteristics-

1. A deep concern for supervisory malpractices which affect occupations that essentially cannot be supervised because of the nature of information processing. This suggests that future occupations are likely to be considerd, in terms of their status, as requiring professional levels of competence. As such, they are likely to be self-governing and regard themselves as "communicators" or "controllers".
2. Communications employees are likely to desire and prosper from collegial rather than authoritarian approaches to supervision. They will exhibit a keen need for supervisory support when inevitable human errors occur and will want constructive rather than punitive efforts from supervisors in performance appraisals.
3. Communications employees are likely to create their own workplace culture.
4. Mental health rather than physical health concerns are likely to prevail.
5. Communications employees are likely to want more participation in the governance and decision-making processes.
6. Because of technological alternatives, the future employee is likely to challenge prevailing notions about the significance of time spent at a particular location.
7. Future employees are expected to press for substantial salary and fringe benefits that are consistent with their self-image as professional "communicators".
8. Future employees are likely to be skeptical of management's good intentions, and thus inclined to to meet power with power. (Telecommunication networks will facilitate this).

To facilitate the mangement of the Information Society organizations, Dr. Christopher Waagen (1982) has identified Theory Z (a hybrid of Japanese and American mangement styles) as the candidate for most probable success in future management. The characteristics of Theory Z are as follows-

1. The employment of a Japanese type of integrated coordination that stimulates personal involvement to create an intimacy among those working through to long term goals is essential. In the Japanese system there are no written job descriptions that function to keep employees from fully participating and assisting in achieving organizational goals. Thus, cooperative problem-solving is possible. This is contrasted to the American system where people seek standardized roles or occupations that often result in short-term relationships that foster a lack of personal involvement.
2. The employment of the Japanese management strategy of involving employees in the organizational identity through (1) group decision-making and (2) establishing common ground through interdisciplinary understanding is essential. Thus disagreements are resolved by focusing on problems rather than on personalities. All employees participate in living the organizational philosophy.
3. The development of employees who identify with a larger level of existence--the community is greater than the individual--is essential.

Dr. Arthur Shostak noted at the World Future Society Conference (1982) that a fundamental difference between the Japanese educational

system and the American educational system is that the Japanese are always concerned with how to prepare tomorrow's employee while the United States concentrates on how to prepare people for today's careers. He noted that perhaps we should be less concerned with accountability and more concerned with capability--and show more interest in the future.

Implications of an Information Society

In a brief survey paper such as this, it is impossible to provide compiete assessment of the implications of computers and telecommunications in an Information Society. Such a study would employ a Futurist consultant using such processes as Systems Analysis, Demographic Analysis, Future Research, Technology Assessment, Vulnerability Analysis and other forcasting techniques. I will, however, indicate some of the more obvious implications of this societal transformation in which we are participating.

It would be wise to recognize at the outset that computer-communications technology can, is likely to, and probably should automate the production processes of the Industrial Era. If so, then we should expect that computer-communications technology should spawn an economy based upon information and knowledge-oriented services and occupations, that are systems connected. A knowledge and information based economy necessarily reflects unification and integration, on a system level, of the social and technological elements that comprise the system. Hence a "systems understanding," leading to "systems thinking" becomes a necessary ingredient in future educational processes and living arrangements.

It seems likely that the educational system must undergo a reconceptualization if it is to adapt to Information Society values. In the

first place, massive infusion of money to develop facilities and attract teachers does not address the content deficiencies of the present system. We must recognize that the present educational system is a product of the Industrial Era. Therefore, it is system limited in terms of the Communications Era. The present educational system is largely a product of the "melting-pot mindset"; it is designed to "dazzle" and "disintegrate". Yesterday's classroom "staredowns" are today's latent "political showdowns". The present educational system, reinforced by its external culture, has succeeded in splitting the individual conscience, splitting the family and splitting the atom. It's no wonder that people take drugs. What is needed is a "salad-bowl mindset"; where ideas are tossed together, maintain their identity, and are integrated at some higher system level of comittment. What is taught, how it is taught, where it is taught and when it is taught are as subject to fundamental change as the meta change represented by the Information Society itself. The mere inclusion of a computer in the instructional program and, worst of all, an emphasis on Career Education for careers that are not going to exist in the future is the application of both a band-aid and lotion upon a cancer that, at this point, requires surgery and nuclear as well as solar medicine. It seems worthwhile to resist added taxation for an educational system that has faltered. Yet it may be worthwhile to increase educational taxation to its limits and hasten the change through other economically viable alternatives. It is essential that a revitalized educational system adopt an interdisciplinary and integrative outlook. To do otherwise perpetuates the divisions in society. At the very minimum--some people must become interdisciplinary.

Politically, the Information Society poses a threat to the concept of Industrial Era "representative democracy". The technological means of telecommunication and computer systems affords a fundamental change in the behavior patterns and desires of the citizenry. With the technological means available for citizens to participate in decision-making, pressures for a participatory democracy are already emerging. The implications or government by individual (or even representative) conscience as contrasted to collectiv conscience have not been fully explored. It is likely to prove incumbent upon the individual conscience to participate at the level of knowledge creation within the computer-telecommunications systems and generate a collective conscience support for the insight of that individual conscience. The problem with participatory democracy is that you virtually eleminate leadership at the critical time when spontaneous leadership is situationally most important. Spontaneous leadership is the only way to counter "The Abilene Paradox" which is based upon conventional wisdom or desire.

Conventional economic wisdom seems to fall short in an information economy where information value, as a non-exhaustable resource, defies the equalization of human values with economic values. This same conventional economic wisdom is even more deficient when the value added to information, through its acquisition and enhancement, is in terms of the individual who discovers and acts upon new opportunities--such as selling information to other users for further computer enhancement and resale. The Information Society in its present embryonic stage is dominated by class professionals and hobbyists who understand computer-communications and information systems. At this time a very large portion of the American society is effectively shut out of the

future economic mainstream--due to an ignorance that is reinforced by an archaic educational system. It is likely that segments of the population will only gain access to the Information Society with the development of nano-processors, pico-processors, biological-processors, and perhaps ultimately atomic-processors.

VALUE TRENDS
IN THE
INFORMATION SOCIETY

INDUSTRIAL ERA (MASS PRODUCTION VALUES)	COMMUNICATIONS ERA (INFORMATION VALUES)
1. MATERIAL CONSUMPTION ECONOMIC MAN	1. INFORMATION CONSUMPTION INTELLIGENT MAN
2. RESOURCE CONSUMPTION	2. RESOURCE CONSERVATION
A. TIME-VALUE NOW QUANTITY	A. TIME-VALUE FUTURE QUALITY
B. PLACE-VALUE CENTRAL MOBILITY FOR PRODUCTIVITY	B. PLACE-VALUE DE-CENTRALIZED MOBILITY FOR LEISURE
3. MANAGEMENT	3. MANAGEMENT
A. CONTROL (HIERARCHIAL)	A. ANDROGOGY (EQUAL)
B. PRODUCTIVITY	B. PRODUCTIVITY
C. COMPETITIVE	C. COMPETITIVE-COOPERATIVE
D. DISINTEGRATIVE	D. INTEGRATIVE
E. STRESS INCREASING	E. STRESS REDUCING

SOME IMPLICATIONS OF THE INFORMATION SOCIETY

EDUCATION

1. Interdisciplinary Curriculum
2. Systems Oriented Curriculum
3. Teaching Methodologies
4. Competitive Enterprise
5. Information Society Values

POLITICAL

1. Challenge To "Representative Democracy".
2. Elemination of "Spontaneous Leadership".
3. Information Access and Elitism

ECONOMICS

Value-Added Concepts Are Immeasurable In Terms of Information Synthesis.

MANAGEMENT

1. Resource Management
2. Time-Value
3. Place-Value
4. Competitive "Information-Space".

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